

SONY®

DIGITAL AUDIO RECORDER

PCM-2000



DIGITAL

OPERATION MANUAL

1st Edition (Revised 3)

Serial No. 10001 and Higher

For the customers in the U.S.A.

Warning—This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

Important—To insure that the complete system (including this peripheral) is capable of complying with the FCC requirements, it is recommended that the user make sure that the individual equipment of the complete system has a label with one of the following statements.

"This equipment has been tested with a Class A Computing Device and has been found to comply with Part 15 of FCC Rules."

-or-

"This equipment complies with the requirements in Part 15 of FCC Rules for a Class A Computing Device."

-or equivalent.

The shielded interface cable recommended in this manual must be used with this equipment in order to comply with the limits for a computing device pursuant to Subpart J of Part 15 of FCC rules.

For the customers in Canada

This apparatus complies with the Class A limits for radio noise emissions set out in Radio Interference Regulations.

Pour les utilisateurs au Canada

Cet appareil est conforme aux normes Classe A pour bruits radioélectriques, spécifiés dans le Règlement sur le brouillage radioélectrique.

1-1. Overview of the PCM-2000

The PCM-2000 is a portable digital audio recorder designed in compliance with the DAT (digital audio tape recorder) format.

With this unit, recording as well as playback in connection with professional digital audio equipment is possible, enabling the DAT cassette recorder to be used in professional fields.

A DAT format tape recorder

Excellent sound quality

The DAT recorder digitizes the audio signal and then records it. Thus, compared with a conventional analog tape recorder, tape-to-tape dubbing is possible with no deterioration in sound quality.

Smaller cassette

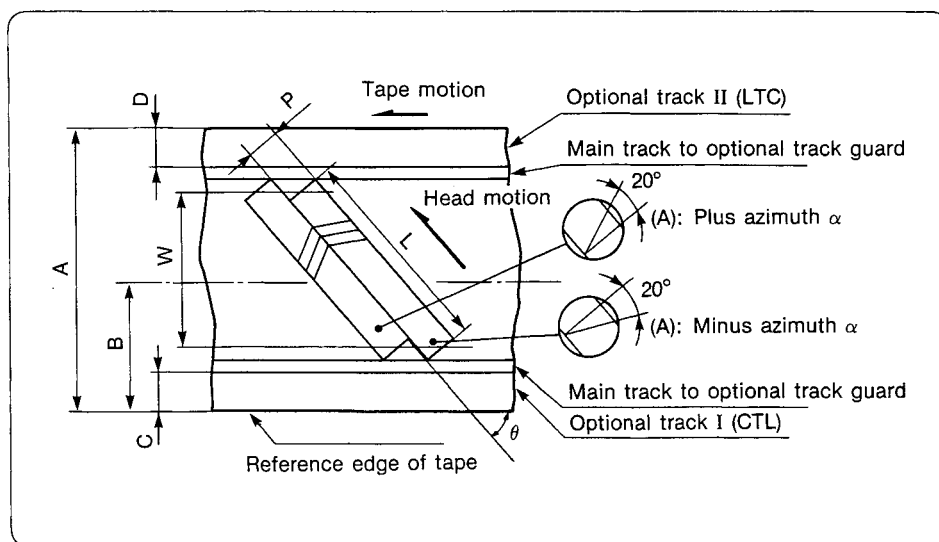
Developed exclusively for DAT, the cassette is half the size of conventional analog compact cassettes ($73 \times 54 \times 10.5\text{mm}$, tape width 3.81mm). Two hours of continuous recording and playback are possible.

High-speed search with the sub codes

In addition to the PCM area for recording audio signals, a DAT tape includes a sub code area.

Three kinds of sub codes (start ID, program number, skip ID) can be written in the sub code area. The start ID and program number let you locate a particular portion of the tape quickly. The skip ID allows you to skip an unwanted portion during playback.

DAT track format



A: Tape width
W: Effective recording width
L: Track length
P: Track pitch
B: PCM center

C: Optional track I (CTL)
D: Optional track II (LTC)
 θ : Track angle
 α : Head gap azimuth angle

Usable for both analog and digital audio systems

Utilizing the built-in 16-bit A/D and D/A converters for inputs and outputs, analog audio signals can be directly input to the unit for digital recording/playback. The A/D and D/A converter is equipped with a double oversampling digital filter.

Multiple power sources

An NP-1A or NP-1 battery pack, or an AC-500 AC power adaptor can be used.

Connection with digital audio equipment

Selectable sampling frequency

When recording analog signals, the following sampling frequencies can be selected from among 48kHz, 44.1kHz and 44.056kHz. During playback, these four sampling frequencies are available: 48kHz, 44.1kHz, 44.056kHz and 32kHz.

When recording digital signals, the sampling frequencies can be selected automatically according to the input signals.

Time code input/output

With an external time code generator/reader connected, recording and playing back of longitudinal time code is possible on the DAT recorder.

Synchronized operation with other equipment

With the word sync signal input from other equipment, the recorder can be operated in synchronization with it.

2-1. Power Sources

The unit operates on the following power sources.

- Sony NP-1A or NP-1 rechargeable battery pack
- Sony AC-500 AC power adaptor
- Commercially available DC power source
(operating voltage: 12 to 15V, more than 5A)

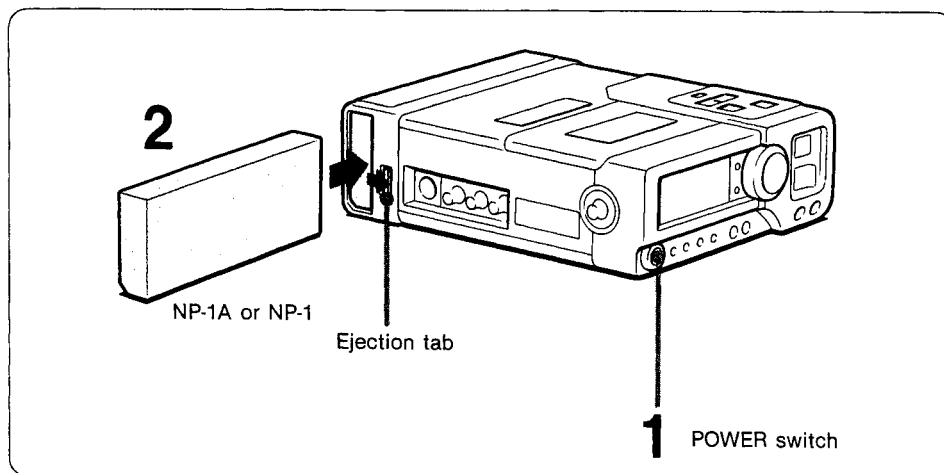
2-1-1. Rechargeable Battery Pack

A fully-charged battery pack provides power for approximately 1.5 hours of continuous recording of a PCM-2000 recorder.

Charging

Before operating, always charge the battery pack using the BC-1WA battery charger. The charging period is approximately 1 hour at normal temperature. For details on charging, refer to the instruction manual of the BC-1WA.

Battery installation



1 Make sure that the POWER switch is set to OFF.

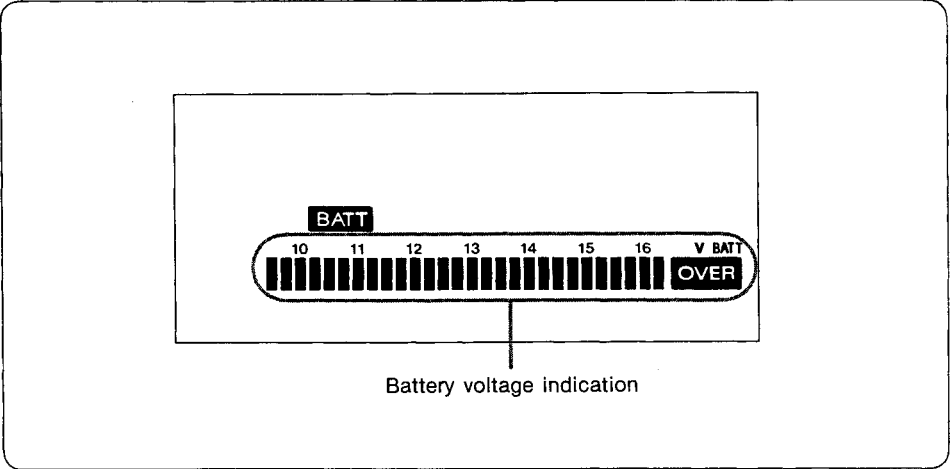
2 Insert the battery pack.

To remove the battery pack

Slide the battery pack ejection tab in the direction of the arrow.

To check battery condition

Press BATT CHECK button.
The level meter on the display indicates the approximate battery voltage.



Battery voltage	Battery condition
Approx. 11.5V to 16V	Normal operable range
Less than approx. 11.5V	The BATT indicator starts blinking slowly. Approximately two seconds after 10.5V is reached, the recorder stops. (BATT and CAUTION indicators appear in the display.) No operation except tape ejection functions.*
More than approx. 16V	OVER indicator appears, indicating the voltage is too high.

Notes on battery pack

- When the unit is to be stored, remove the battery pack from the battery compartment. If the battery pack is left installed, the power will drain, even if the POWER switch is set to OFF.
- Use a fully-charged battery pack. If a battery pack not fully-charged is used, the battery voltage may suddenly go down.

On battery life and charging time

The continuous operating time and charging time vary according to the conditions such as temperature. They vary also according to whether a microphone is connected to the recorder or not. Use a fully-charged battery pack.

Replacing the battery pack during operation

Before replacing the battery pack, connect the AC-500 AC power adaptor or another external power source to the DC IN 12V on the left side panel. The recorder will operate without interruption, even when the battery pack is removed from the recorder.

When the AC power adaptor is connected while the battery pack is installed

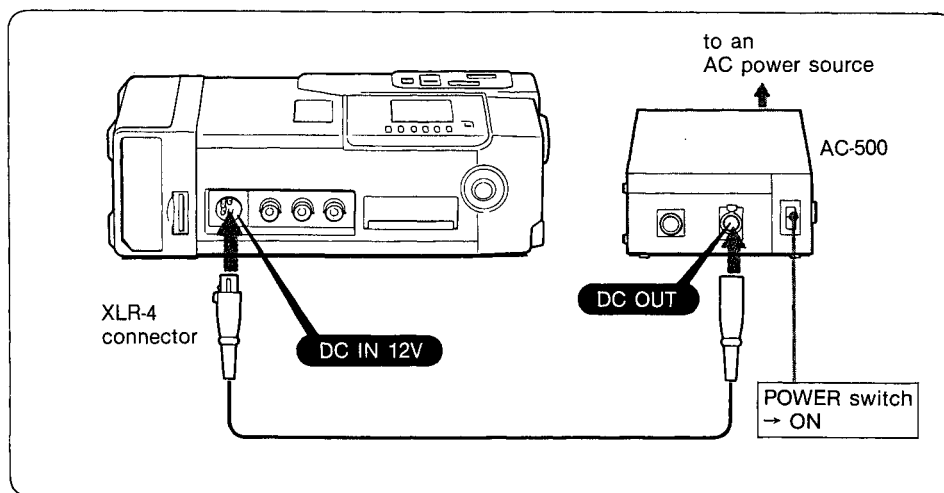
Power is automatically supplied from the one with the higher voltage.

* Battery voltage may be increased to more than 11.5V temporarily. However, no operation except tape ejection will function. If this occurs, turn off the power. Change the battery pack, or connect a DC power source with the appropriate operating voltage range.

2-1-2. Other Power Sources

AC power

Connect the AC-500 AC power adaptor as follows.



For details, refer to the instruction manual of the AC-500.

DC power

Connect a DC power source with a power supply voltage ranging from 12V to 15V (more than 5A) to the DC IN 12V connector (XLR, 4-pin) of the recorder.

Note

Do not use a DC power source with an electric current of less than 5A. Battery voltage of the output will be decreased temporarily when the recorder loads a tape or starts playback which may cause malfunction.

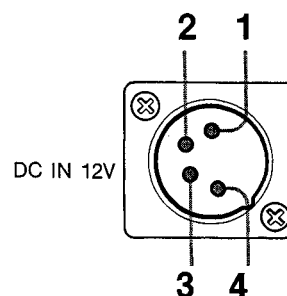
Note on DC power source

Be sure to operate the recorder on a power source with an operating voltage ranging from 12 to 15V. Avoid operating it at voltage higher than approx. 16V (OVER indicator appears), as this may cause malfunction of the recorder.

To monitor the power voltage supplied with the external power source, press the BATT CHECK key.

Pin assignment of the XLR-4 type connector

1	GND
2	NC
3	NC
4	+12 to 15V



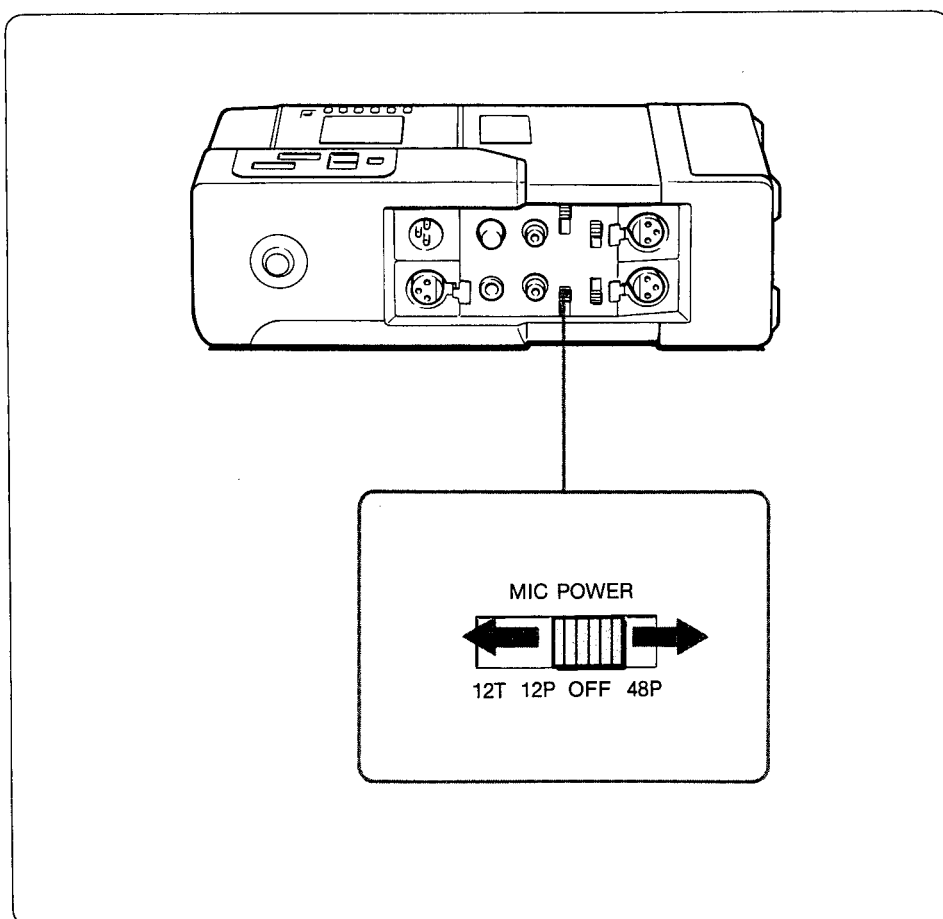
2-1-3. Power Supply of the Microphone

A condenser microphone can be powered with the recorder. According to the microphone to be used, set the MIC POWER selector to suit the power requirements of the microphone type being used.

Note

Do not change the selector setting while the microphone is connected to the recorder.

Type of microphone		MIC POWER selector setting
Phantom power (External power supply)	48V	48P
	12V	12P
AB feed power (External power supply)		12T
No power supply		OFF



2-2. Connection

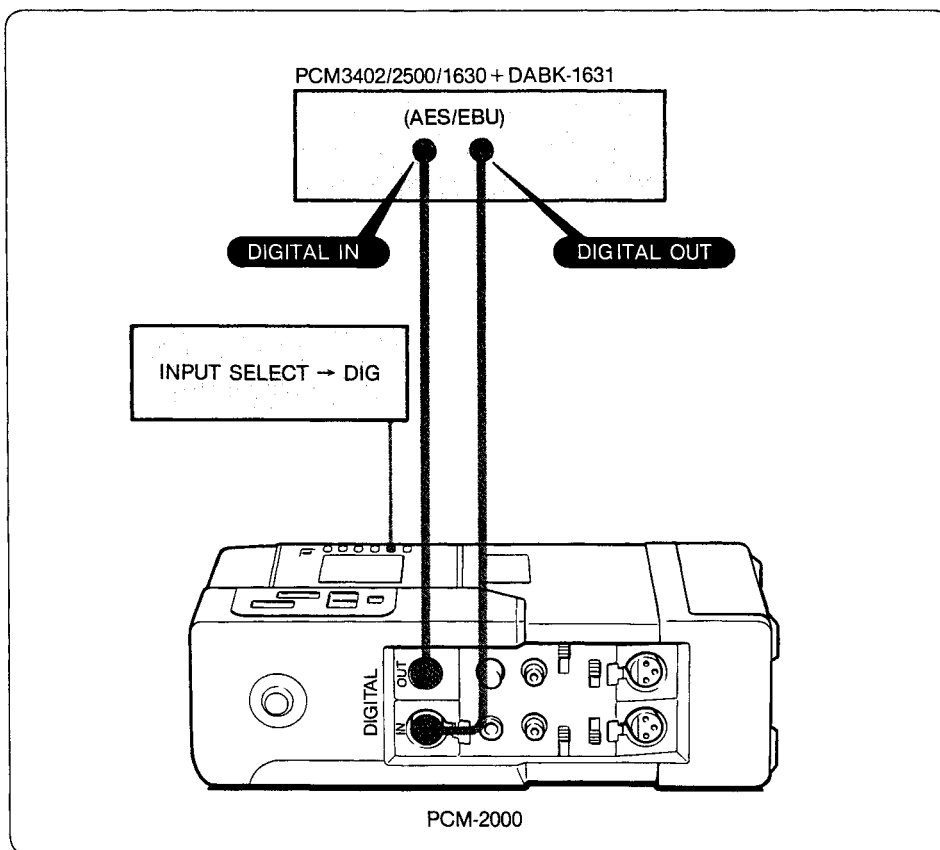
Notes on connection

- Before making any connections, be sure to turn the power of all equipment off.
- For details on connection and operation of each connected piece of equipment, refer to the operation manual furnished with it.

2-2-1. Digital Audio Connection

When the digital inputs/outputs of the PCM-2000 recorder are connected to the following equipment, input signals from the equipment can be recorded with the DAT recorder and the playback sound of the DAT recorder is output to them.

- PCM-3402 digital audio recorder (DASH format)
- PCM-2500 digital audio recorder (DAT format)
- PCM-1630 digital audio processor (with DABK-1631)



Connecting cable for digital signals

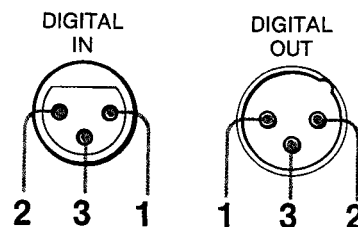
Use optional Sony digital connecting cables, EDC-3C (3m, 9 feet 10 inches), EDC-10C (10m, 32 feet 10 inches), EDC-30C (30m, 98 feet 4 inches).

Selecting the input

According to the connection, match the input selectors of the PCM-2000 and the other equipment connected with it.

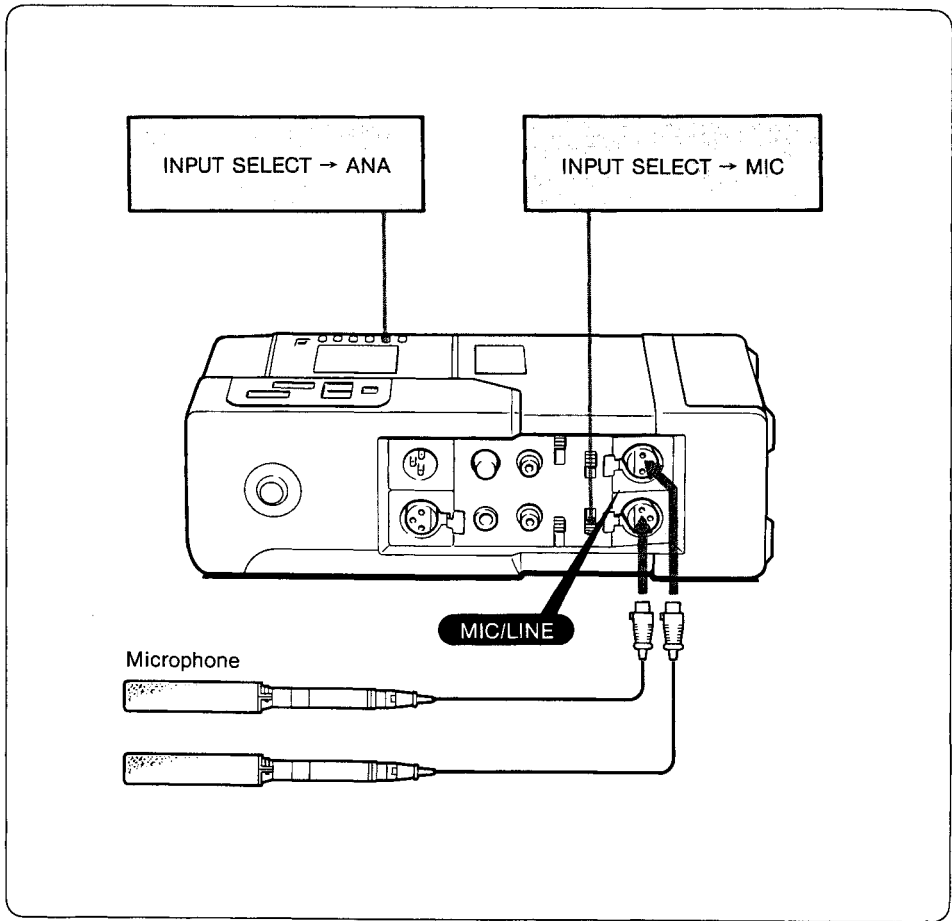
Pin assignment of the XLR type connectors

1	GND
2	HOT
3	COLD

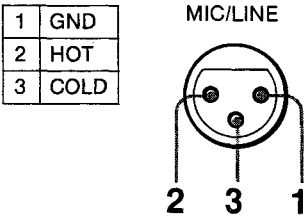


2-2-2. Analog Audio Connections

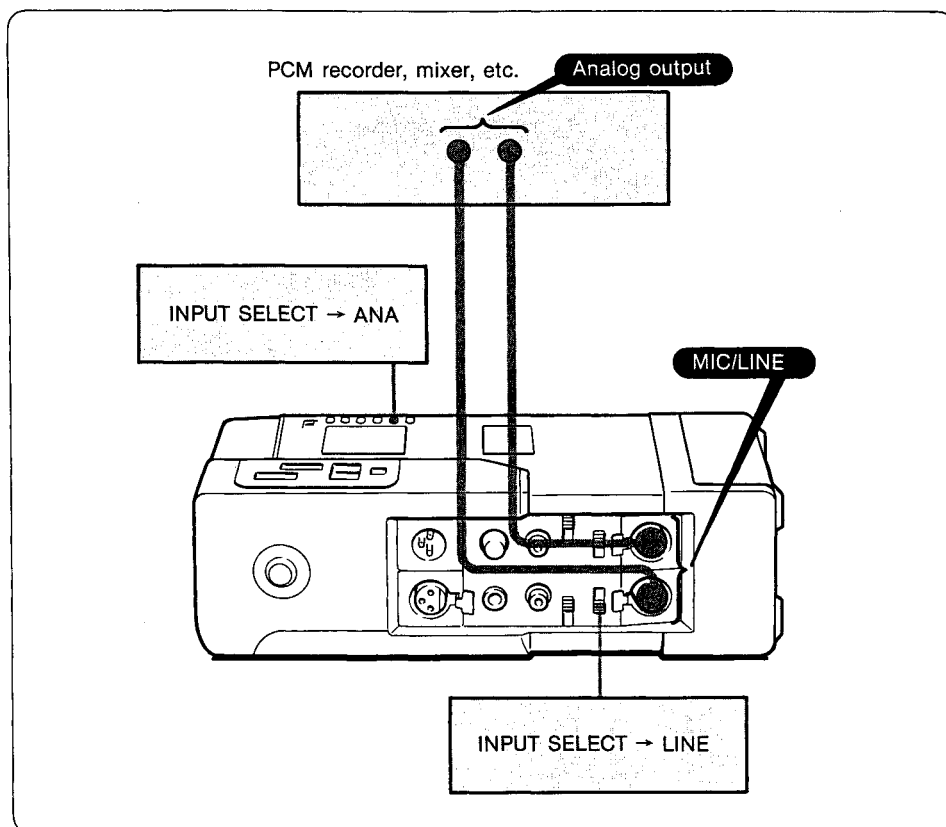
Microphone connection



Pin assignment of the XLR type connector



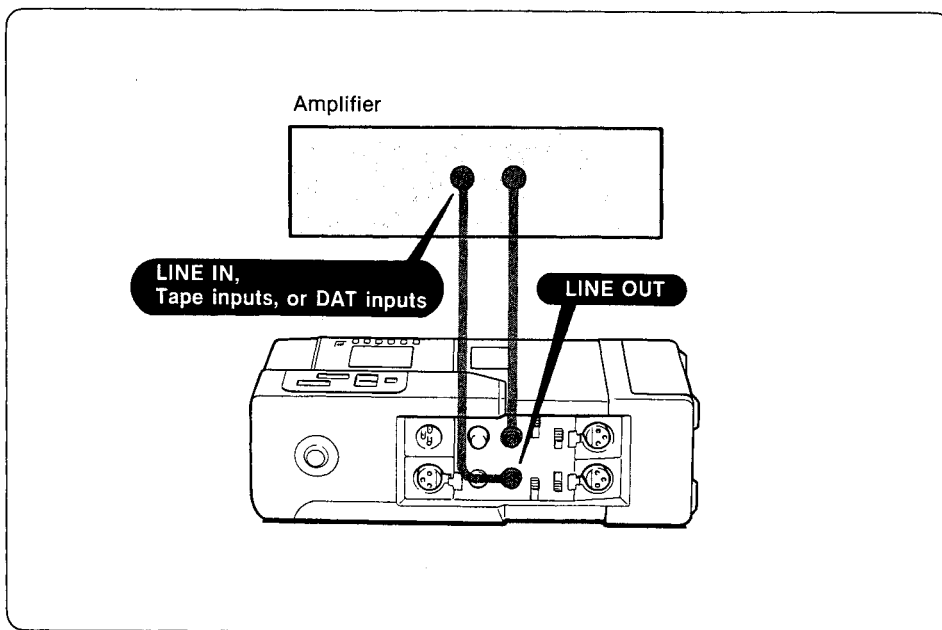
Connection using line inputs/outputs



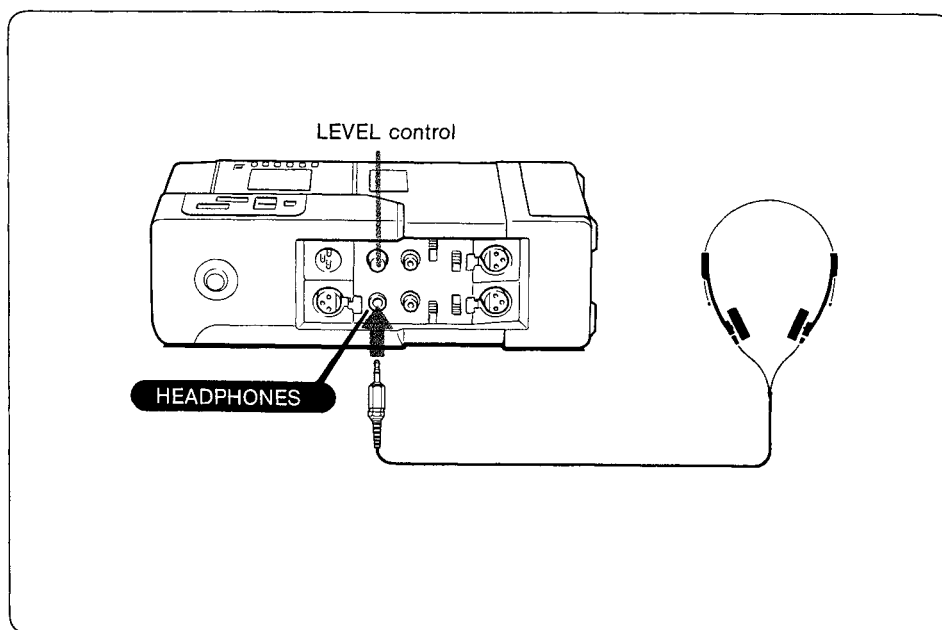
Monitoring the playback sound

The playback audio of the PCM-2000 can be monitored with the following connections.

- **To monitor through speakers:** connect the LINE OUT connectors of the PCM-2000 to the line inputs of the amplifier.



- **To monitor through headphones:** connect stereo headphones to the HEADPHONES jack of the PCM-2000. The headphone volume is adjustable with the LEVEL control.

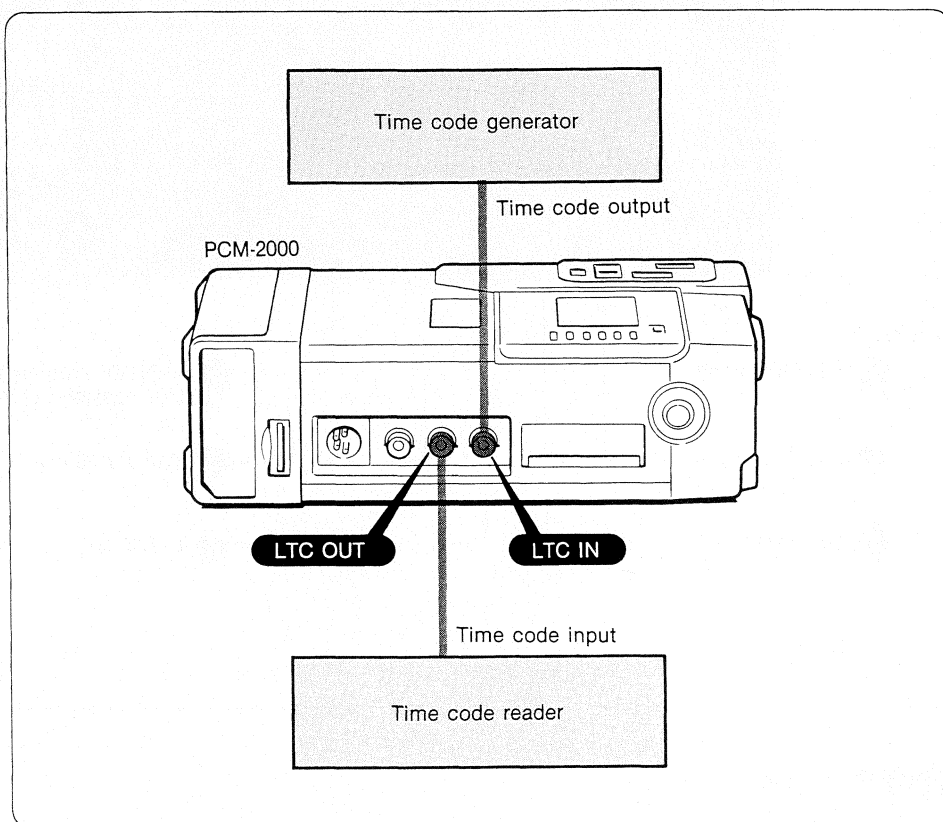


Notes on MIC/LINE input connectors

The L channel of the PCM-2000 corresponds to the CH-1 (1 channel), and the R channel to the CH-2 (2 channel).

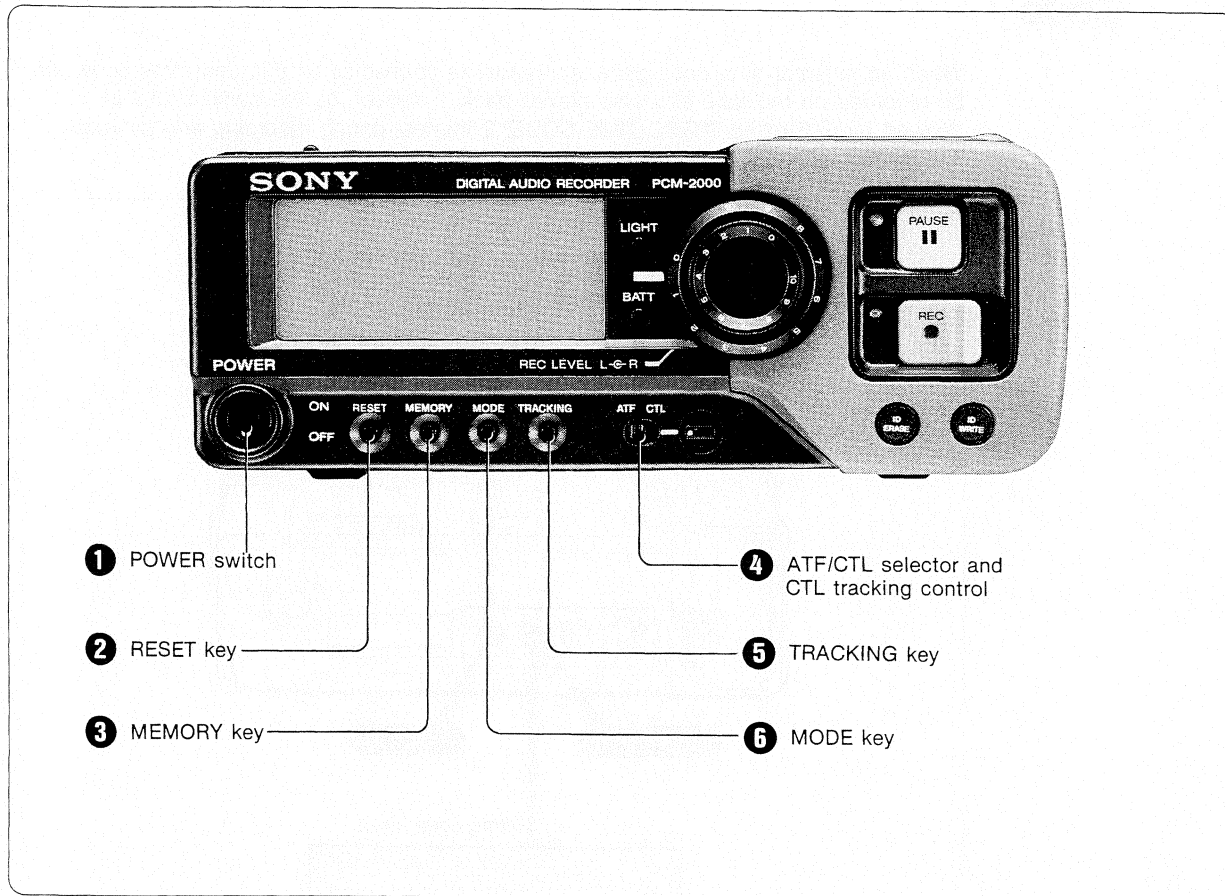
2-2-3. Connection for Recording/Playing Back the Time Code

When an external time code generator/reader is connected to this unit, time code can be recorded on the tape and also played back. However, as the audio signal is delayed by 67.5 msec. (NTSC TIME CODE, 2 frames) during recording and playback, use the time code recorded with this unit only as time information.



2-3. Location and Function of Controls

2-3-1. Front Panel



1 POWER switch

2 RESET key

Resets the counter indication to "0H00M00S". (The counter is automatically reset when the POWER switch is set to on or a cassette is inserted.)

3 MEMORY key

Stores the point where the counter is reset in memory.

4 ATF/CTL selector and CTL tracking control

Selects the way to control the tracking of the tape being played back.

ATF (Automatic Tracking Finding): Controls the tracking automatically during playback. Normally, set to this position.

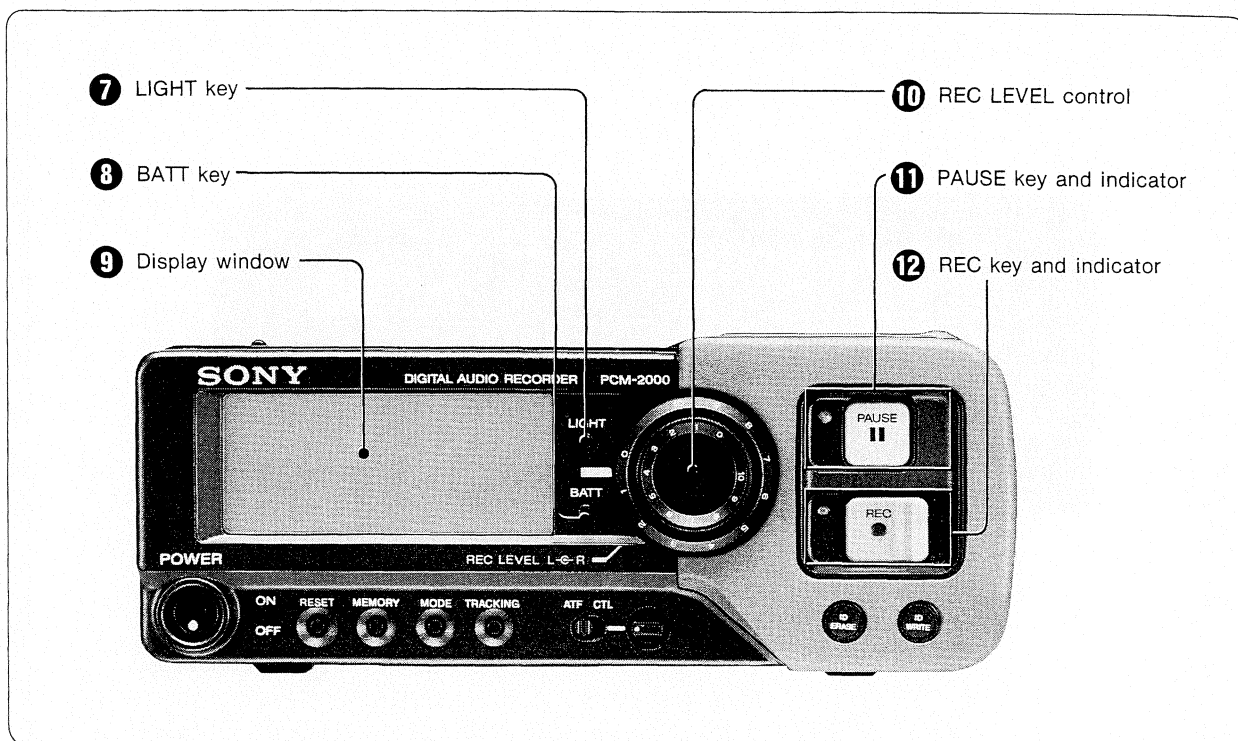
CTL (control): Plays back a tape with CTL signals recorded (e.g. tapes recorded with the PCM-2000). Using the CTL tracking control, adjust the tracking level so that the level meter on the display reaches the highest level.

5 TRACKING key

Press to indicate the output level of both heads, A and B, during playback. Press again to return to the original audio signal level meters.

6 MODE key

Selects the display information as follows: counter→total time remaining on the tape→program number. Each time the key is pressed, the indication changes in sequence.



7 LIGHT key

While the key is kept pressed, the display is illuminated. After you release the key, the illumination continues for approximately ten seconds, and then it goes automatically off.

8 BATT (battery check) key

When this key is pressed, the approximate operating voltage of the power source in use is displayed. The operating voltage of this unit is 12V to 15V. To return to the original audio signal level meters, press again.

9 Display window

Indicates the following information.

- operating modes
- tape running time
- warnings
- various level meters (e.g. the audio signal level, the battery voltage level, the tape tracking level)

10 REC LEVEL (recording level) controls

Adjusts the recording level of the analog input signals. The outer control is for the L(CH-1) channel and the inner control is for the R(CH-2) channel. As these controls are locked to each other, both L and R channels can be adjusted simultaneously. To adjust L and R channels individually, push the inner control (it pops out). After adjusting the each channels, be sure to depress the inner control.

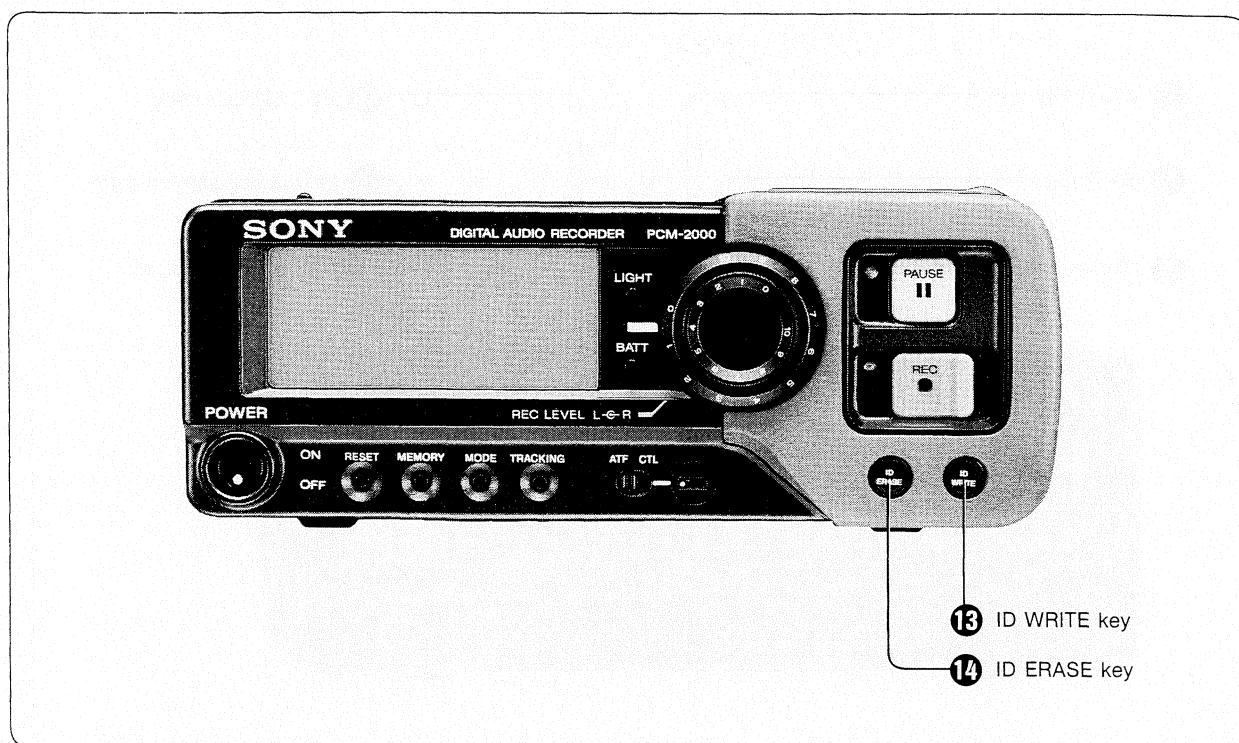
11 PAUSE key and indicator

Stops the tape for a moment. With another press of the key, the pause mode is released, and recording or playback resumes.

The indicator lights up during pause and blinks while the system is being initialized at power-on.

12 REC (record) key and indicator

Slide the key to the right, and recording starts. The indicator lights up during recording. When the safety tab of the DAT cassette is open, recording will not be made.



13 ID WRITE key

Writes the start ID and skip ID.

During playback, the ID (start ID or skip ID) to be written differs depending upon the setting of the SKIP switch (inside the cassette compartment).

When the SKIP switch is set to ON (SKIP is displayed): Skip ID will be written.

When the SKIP switch is set to OFF: Start ID will be written.

During recording, the start ID will be written regardless of the switch setting.

14 ID ERASE key

Erases the start ID and skip ID.

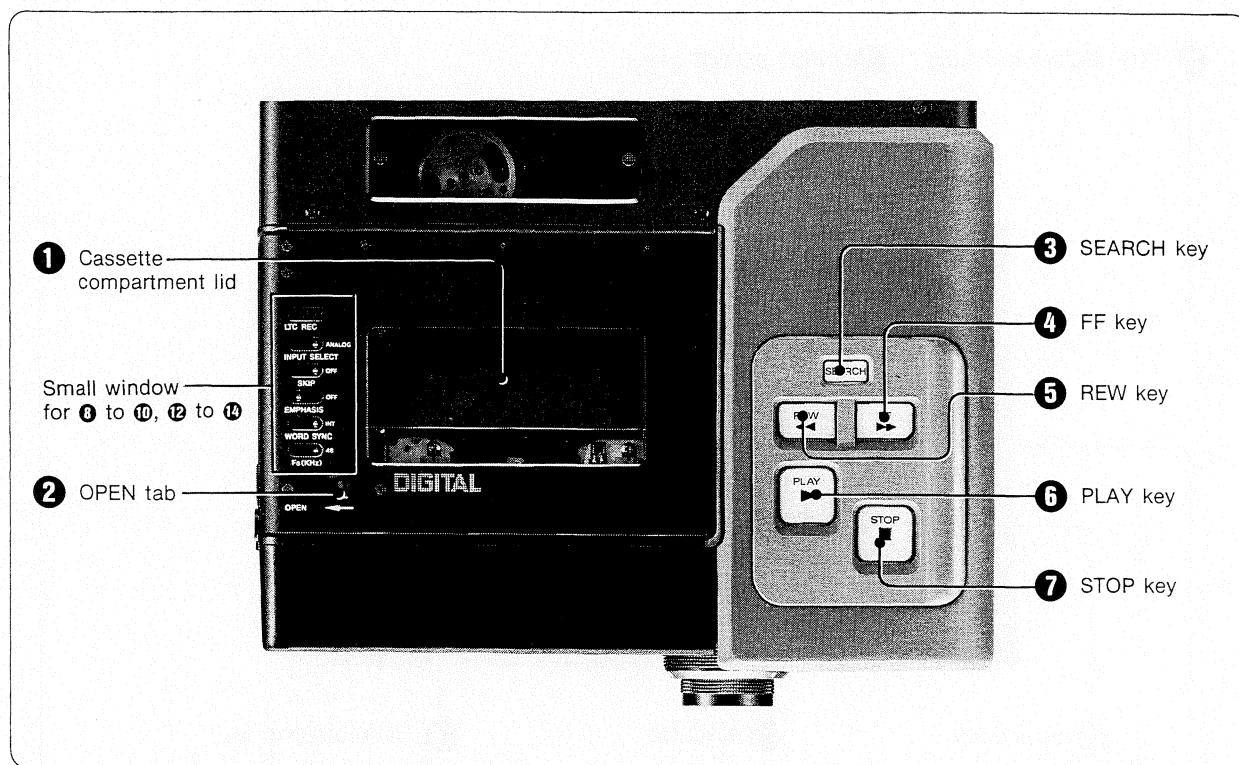
The ID to be erased differs depending upon the setting of the SKIP switch inside the cassette compartment).

When the SKIP switch is set to ON (Skip is displayed): Skip ID will be erased.

When the SKIP switch is set to OFF: Start ID and program number will be erased.

The tape will be rewound to erase the previous ID.

2-3-2. Upper Panel



1 Cassette compartment lid

2 OPEN tab

Slide the tab in the direction of the arrow to open the cassette compartment lid.

3 SEARCH key

Used to detect start IDs (page 35), to activate the music scan function (page 35) and program search function (page 36) during playback, and to set the desired program number during recording.

4 FF (fast forward) key

Advances the tape rapidly.

Used to locate the beginning of a portion with the start ID, or to select the portion directly with the program number during playback. It is also used to arrange the program numbers during recording.

5 REW (rewind) key

Rewinds the tape rapidly.

Used to locate the beginning of a portion with start ID, or to select the portion directly with the program number during playback. It is also used to arrange the program number during recording.

6 PLAY key

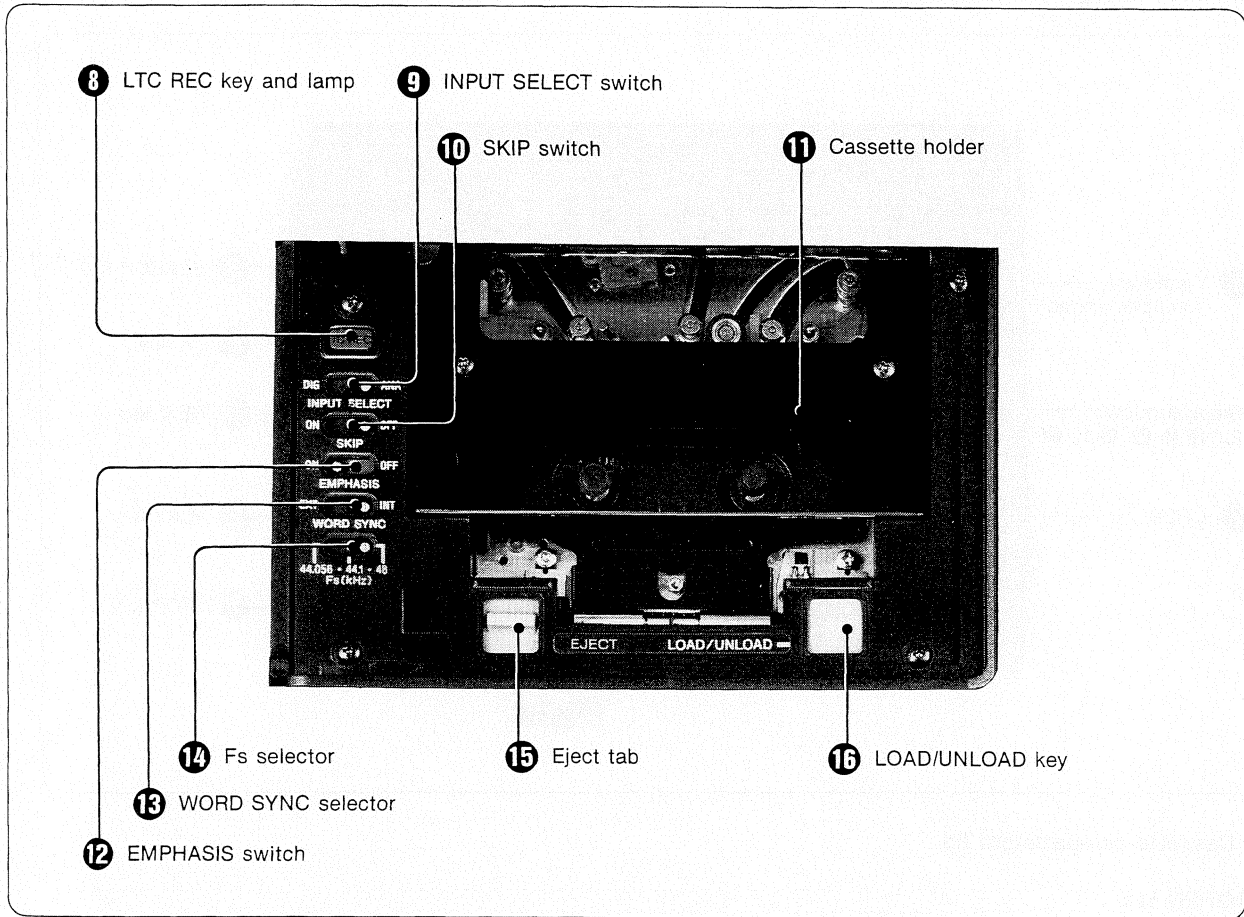
Plays the tape back.

Used to activate the music scan function.

7 STOP key

Stops the tape.

Inside of the cassette compartment lid



8 LTC REC (longitudinal time code record) key and lamp

During recording and playback, the time code of an external time code generator input to the LTC IN connector (on the left panel of the unit) is recorded on the tape. The red lamp lights up when the key is pressed, and the TIME CODE indicator is displayed. If the safety tab of the cassette is open, the time code cannot be recorded. With another press of the key, the recording mode of the time code will be canceled.

9 INPUT SELECT switch

Selects the input source for recording.

DIG (digital): For recording the signals input to the DIGITAL IN connector.

ANA (analog): For recording the signals input to the MIC/LINE input connector.

Factory preset setting: ANA

10 SKIP switch

Selects the ID to write during playback, and selects whether or not to activate the skip function.

Setting	Recording mode	Playback mode		
	To write	To write	To erase	Skip function
ON	Start ID	Skip ID	Skip ID	Yes
OFF		Start ID	Start ID	No

When the switch is set to ON, SKIP indicator appears in the display.

Factory preset setting: OFF

11 Cassette holder

12 EMPHASIS switch

Switches the pre-emphasis circuit on and off while recording the analog input signal. The setting of this switch does not affect the playback and digital recording.

- During playback, the de-emphasis circuit activates according to the emphasis information on the tape being played back.)
- During digital recording, the emphasis information in the input signal is recorded as it is.

When the switch is set to ON, the EMPHASIS indicator appears in the display.

Factory preset setting: OFF

13 WORD SYNC selector

Selects the reference sync signal of this unit during recording and playback.

Setting	Selected reference sync signal
EXT *	External word sync signal input to the WORD SYNC connector on the left panel (EXT SYNC indicator lights up).
INT	Internal word sync signal generated in the unit.

Factory setting: INT

14 Fs (sampling frequency) selector

When recording analog input signals, select the sampling frequency, 48kHz, 44.1kHz or 44.056kHz. The selected frequency is indicated in the display.* *

During playback, the sampling frequency on the tape is automatically selected. (However, when the WORD SYNC selector is set to EXT, set the selector in accordance with the frequency of the input reference signal).

Factory preset setting: 48kHz

15 EJECT tab

Slide the tab toward you to remove the cassette. When a cassette is loaded, first press the LOAD/UNLOAD key to unload the tape from the drum.

16 LOAD/UNLOAD key

After inserting the cassette, press this key to load the tape around the drum or to unload the tape from the drum. The lamp blinks to show that the tape is being loaded or unloaded.

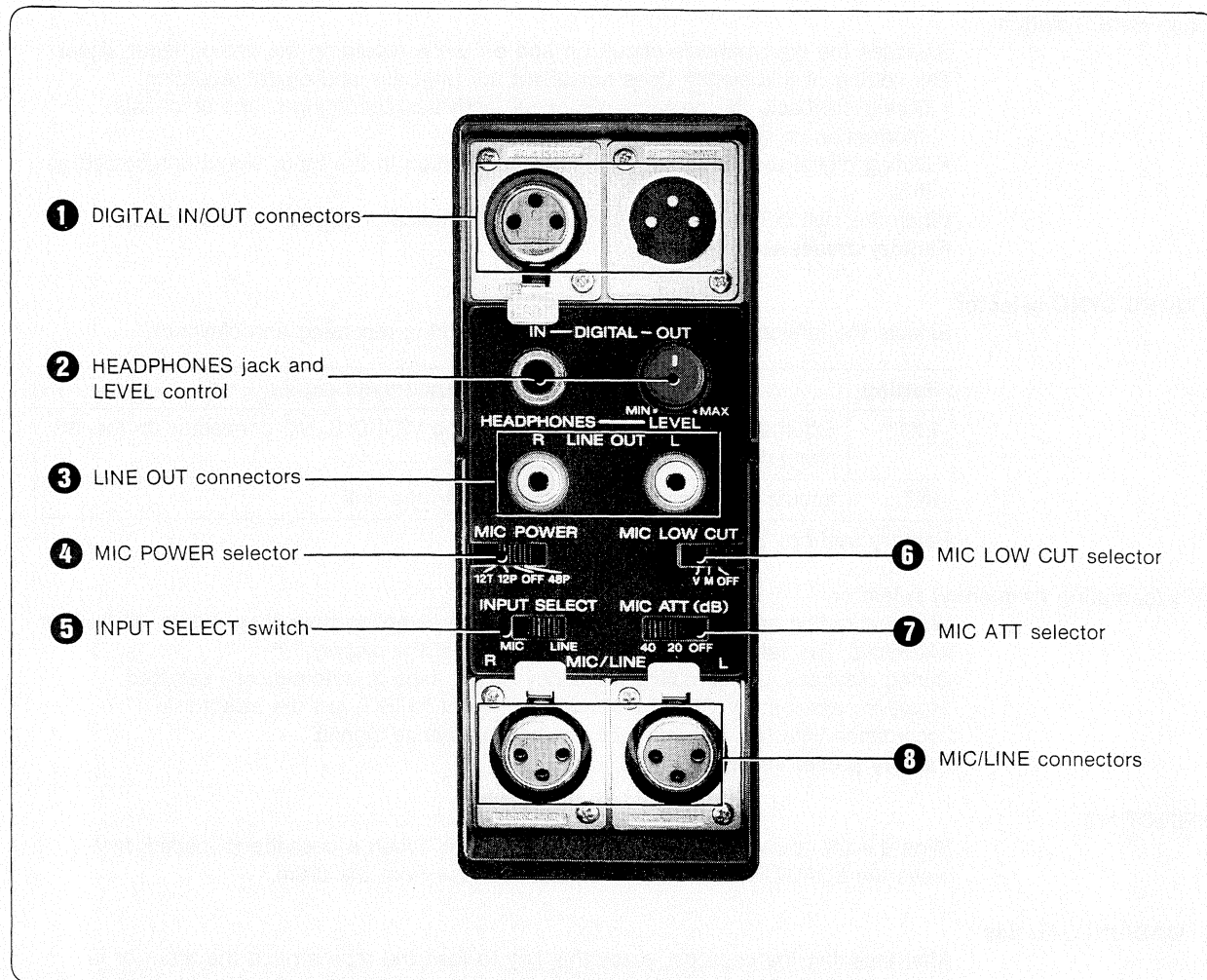
* Notes on setting the WORD SYNC selector to EXT

- Select the reference sampling frequency of the input signal with the Fs selector.
For recording: Select the desired frequency.
For play back: Set the selector to the frequency corresponding to that on the tape.
- If a word sync signal is not input to the WORD SYNC connector, the unit will not activate correctly.

* * Notes on the display of sampling frequency

While a non-recorded area on the tape is playing back or advancing, the sampling frequency blinks.

2-3-3. Right Side Panel



- 1 DIGITAL IN/OUT (digital input/output) connector** (XLR-3-31/XLR-3-32 or equivalent)
Input or output for a digital audio signal conforming to the AES/EBU format.

Pin assignment of the connectors

1: GND	2: HOT	3: COLD
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- 2 HEADPHONES jack** (stereo phone jack) **and LEVEL control**
Connect headphones (with impedance more than 32 ohms) for monitoring. The headphones volume is adjustable with the LEVEL control.
- 3 LINE OUT (line output) connector** (phono jack)
Output the analog audio signals. Connect to the inputs of the amplifier to monitor the playback sound of the recorder.

4 MIC POWER (microphone power supply) selector

Selects voltage according to the power requirements of the microphones to be connected to the MIC/LINE input connector.

Setting	Type of the microphone	Voltage (load)
48P	Phantom powering	48V (2mA)
12P		12V (10mA)
12T	AB feed powering	12V (10mA)
OFF	No power is supplied to the microphone. Set to this position when using dynamic microphones or microphones with a built-in power source.	

Factory preset setting: OFF

5 INPUT SELECT (analog input select) switch

Sets according to the equipment to be connected to the MIC/LINE input connectors.

Setting	Equipment to be connected
MIC	External microphone
LINE	Analog input signal (line outputs of an analog tape recorder or mixer)

Factory preset setting: LINE

6 MIC LOW CUT selector

Lower frequencies of the microphone input signal can be attenuated with this selector. Set the selector according to the input source.

Setting	Input source
V	Voice (12dB/octave HPF below 200Hz)
M	Music (6dB/octave HPF below 100Hz)
OFF	The input signal will not undergo attenuation; it will be flat.

Factory preset setting: OFF

7 MIC ATT (microphone attenuator) selector

Attenuates the microphone input level by 20dB or 40dB. Set to OFF to disengage the attenuation.

Factory preset setting: OFF

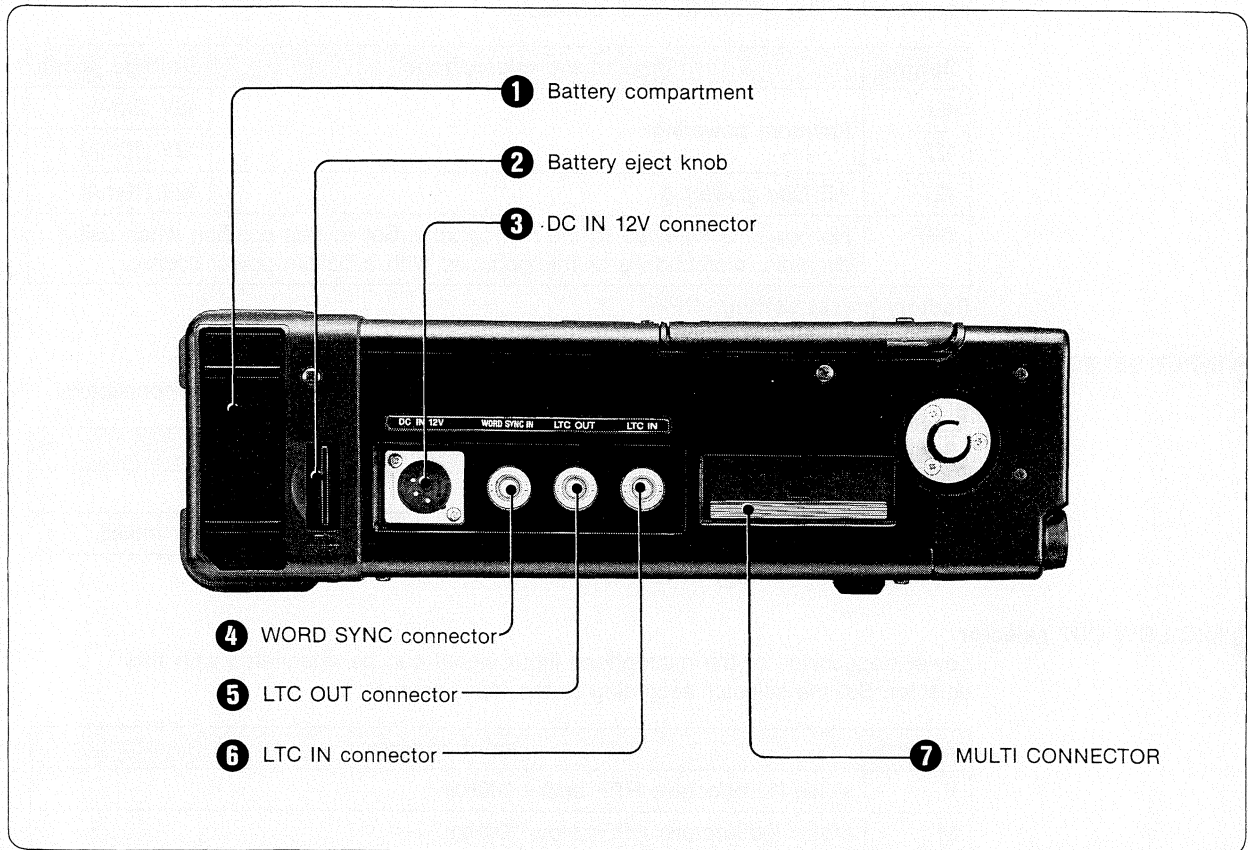
8 MIC/LINE input connectors (XLR-3-31 or equivalent)

Inputs microphone signals or line output signals. After connection, select the input source with the INPUT SELECT switch 5 on the same panel.

Pin assignment of the connector

1: GND	2: HOT	3: COLD
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2-3-4. Left Side Panel



1 Battery compartment

Insert NP-1A or NP-1 battery pack (optional).

2 Battery ejection tab

To remove the battery pack, slide the tab in the direction of the arrow.

3 DC IN 12V (external power input) connector (XLR type, 4-pin)

Connect the DC cord of the AC-500 AC power adaptor when operating the unit on AC power. Or connect a DC power source whose operating voltage is 12V to 15V (more than 5A).

4 WORD SYNC input connector (BNC type)

Inputs the word sync signal. When this unit is to be operated in synchronization with other equipment, this connector inputs the word sync signal. In this case, set the Fs selector of this unit to suit to the sampling frequency of the word sync signal.

5 LTC OUT (longitudinal time code output) connector (BNC type)

Connect to the input of the external time code reader. This connector outputs the time code recorded on the tape.

6 LTC IN (longitudinal time code input) connector (BNC type)

Connects to the output of the external time code generator. Time code input to this unit can be recorded on the tape using the LTC REC key inside the cassette compartment.

7 MULTI CONNECTOR (60-pin)

This connector is provided to expand the function of the PCM-2000 in the future.

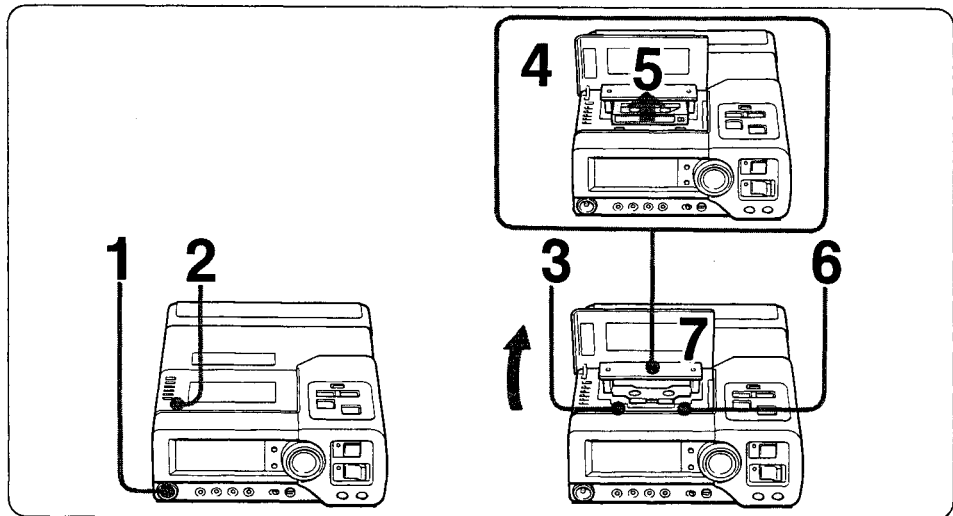
Pin assignment of the MULTI CONNECTOR

Pin No.	Signal	Remarks
1	CEON	Connector operate signal (on line/off line)
2	+5V	DC power output (I = 100mA)
3	GND	DC power output
4	DFCK	Clock signal of 256 times Fs
5	GND	Ground signal
6	DIOC	Clock signal of 128 times Fs
7	BCK	Clock signal of 64 times Fs
8	LRCK	Fs (WCK output)
9	LR01	Delayed Fs output (15 BCK)
10	ERRF	Error flag
11	DADT	PCM serial output
12	DATA0	} Transmission data
13	DATA1	
14	DATA2	
15	DATA3	
16	N.C.	Not connected
17	WCK IN	WORD SYNC input
18	N.C.	Not connected
19	EXREF	Signal for synchronizer (center frequency is 9.6kHz)
20	REQ	Transmission control (microcomputer output)
21	BUSY	Transmission control (microcomputer input)
22	N.C.	Not connected
23	MACK	Transmission control (microcomputer input)
24	LTC IN	Time code input (SMPTE)
25	SBCK	Transmission control (microcomputer output)
26	LTC OUT	Time code output (SMPTE)
27	SRVS	Reference signal for the tape speed servo control
28	CTL PULSE	CTL signal
29	FG OUT	Capstan FG signal
30	} N.C.	Not connected
45		
46	} GND	Not connected
60		

2-4. About the DAT cassette

2-4-1. Inserting/Removing the Cassette

Inserting the cassette

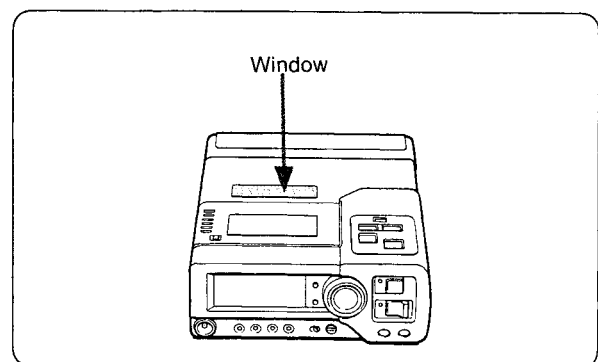


- 1** Set the POWER switch to ON.
- 2** Slide the OPEN tab in the direction of the arrow, and open the cassette compartment lid.
- 3** Slide the EJECT tab toward you.
The cassette holder inside jumps up.
- 4** Insert a DAT cassette firmly.
- 5** Push in the cassette holder.
- 6** Press the LOAD/UNLOAD key to load the tape.
While the tape is being loaded, the red lamp on the key blinks.
- 7** Close the cassette compartment lid.

Now, the cassette is ready to start recording or playback.

To check whether the tape is loaded or not

When you look into the window and if you see the tape, it means that the tape is loaded.

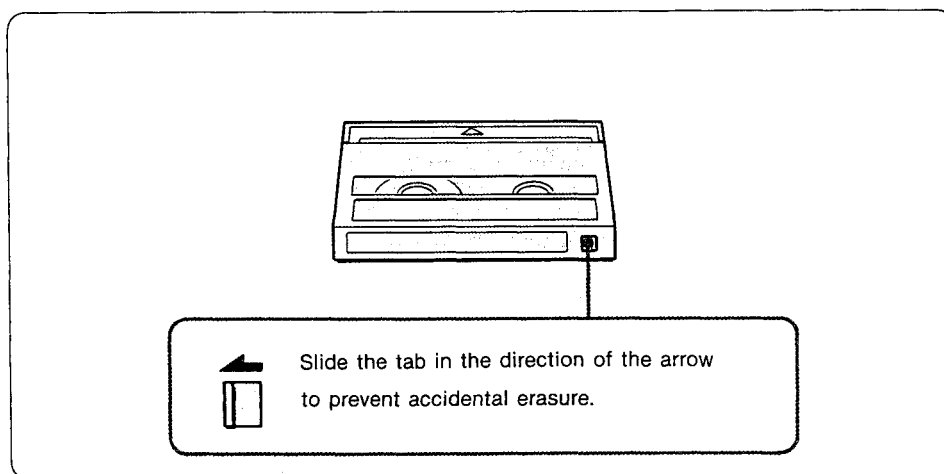


Removing the cassette

- 1** Turn on the power to the unit and open the cassette compartment lid.
- 2 Only when the tape is loaded:**
Press the LOAD/UNLOAD key to unload the tape.
While the tape is being unloaded, the red lamp on the key blinks.
- 3** Slide the EJECT tab toward you, and remove the cassette.

2-4-2. Preventing Accidental Erasure

To prevent the recorded tape from accidental erasure, set the safety tab to the position as shown below.



To write sub codes and/or time code during recording or playback

Slide the tab to the original position.

3-1. Recording

With this unit, either an analog source input to the MIC/LINE connector or a digital source input to the DIGITAL IN connector can be recorded digitally on the DAT tape. When recording an analog signal, the unit can write sub codes (start ID and program number) on a DAT tape.

When recording a digital signal, the unit cannot write a new sub code but it can write the sub codes already recorded on the source.* CTL signal is always recorded automatically on a tape in the longitudinal direction. (option track I).

3-1-1. Preparations

Checking the connection

Power source Check that the power sources are correctly connected. (See "2-1. Power Sources")
When recording using the battery pack, press the BATT CHECK key and check the voltage. Charge the battery pack if necessary.

Connection Check that the input signal is correctly connected. (See "2-2. Connection")

Setting of each selector

Selecting the input signal

Set the INPUT SELECT switch in the cassette compartment according to the signal to be input.

Setting	Signal to be recorded
DIG	Digital (Input signal of the DIGITAL IN connectors)
ANA	Analog (Input signal of the MIC/LINE input connectors)

For analog signal input

According to the equipment connected, select the input of the MIC/LINE connectors using the INPUT SELECT switch.

Setting	Connected equipment to the MIC/LINE input connectors
MIC	Microphone
LINE	Line input equipment

*When using a PCM-2000 as a digital source, the start and skip IDs on a tape can be recorded (copied), but not program number.

Selecting the sampling frequency

When recording an analog signal, select the sampling frequency from among 48kHz, 44.1kHz and 44.056kHz using the Fs selector.

When recording a digital signal, the sampling frequency of the input source is automatically selected regardless of the selector setting.*

The selected sampling frequency is indicated in the display.

48.000kHz

Selecting the emphasis

When recording an analog signal, switch the built-in pre-emphasis circuit on or off using the EMPHASIS switch.

When the EMPHASIS switch is set to ON

The built-in emphasis circuit improves the signal-to-noise ratio of high frequencies by raising their relative level during recording (pre-emphasis) and lowering it in playback (de-emphasis).

Selecting the word sync signal

Select the reference sync signal to be used with the WORD SYNC selector.

Setting	Reference sync signal to be used
EXT	External reference sync signal input to the WORD SYNC IN connector.
INT	Internal reference sync signal

When the selector is set to EXT

- The EXT SYNC indicator appears in the display. If no signal is supplied to the WORD SYNC IN connector, a recording cannot be made correctly.
- Select the sampling frequency of the reference signal using the Fs selector.

EXT SYNC

When recording digital input

The word sync signal will not function regardless of the selector setting.

* Note on recording digital signals

When Fs (the sampling frequency) code on the channel status of the input source matches the table below, the sampling frequency is automatically selected. When the Fs code does not match the table, "kHz" blinks in the display. Select the sampling frequency manually with Fs selector.

Sampling frequency and channel status data (C-5, 6, 7, bit)

Fs	C-5	C-6	C-7
48 kHz	0	0	0
44.1 kHz	0	1	0
44.056 kHz	1	1	0
32 kHz	0	1	1

Input level adjustment of the microphone

Connect the microphone to the MIC/LINE input connector, and set the INPUT SELECT switch to MIC.

Adjust the input level according to the recording source.

Low cutting of the input signal

Input signal of lower frequencies may be heard as a noise. In this case, set the MIC LOW CUT selector according to the input source to cut the lower frequencies

Input source	Selector setting
Voice	V
Music	M

To deactivate this low cut circuit, set the selector to OFF.

Attenuating the input level

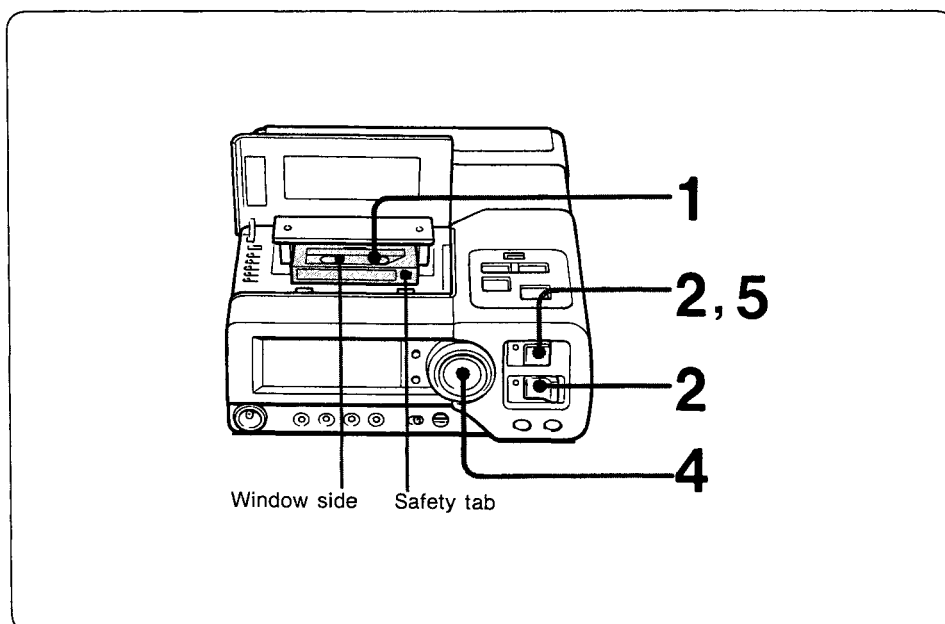
If the recording input level is too high and the sound is distorted, set the attenuating level to 20 dB or 40 dB using the MIC ATT selector.

3-1-2. Recording Procedure

Preparation

Before recording, first follow the steps in “3-1-1. Preparation”.

Operation



- 1** Insert a cassette.
Refer to “2-4. About the DAT cassette”.
Check that the safety tab is closed.
- 2** Set the recorder in the recording pause mode.
Press **II** PAUSE (the indicator lights up) and slide **●** REC to the right (the indicator lights up).
- 3** Input the recording source.
- 4** Adjust the recording level for both channels using the REC LEVEL controls. (only when recording analog input)
1) Adjust the L channel with the outer control.
2) Press the inner control (it pops out) and adjust the R channel. Push the control back in.
- 5** Press **II** PAUSE to release the pause mode.
Recording starts.

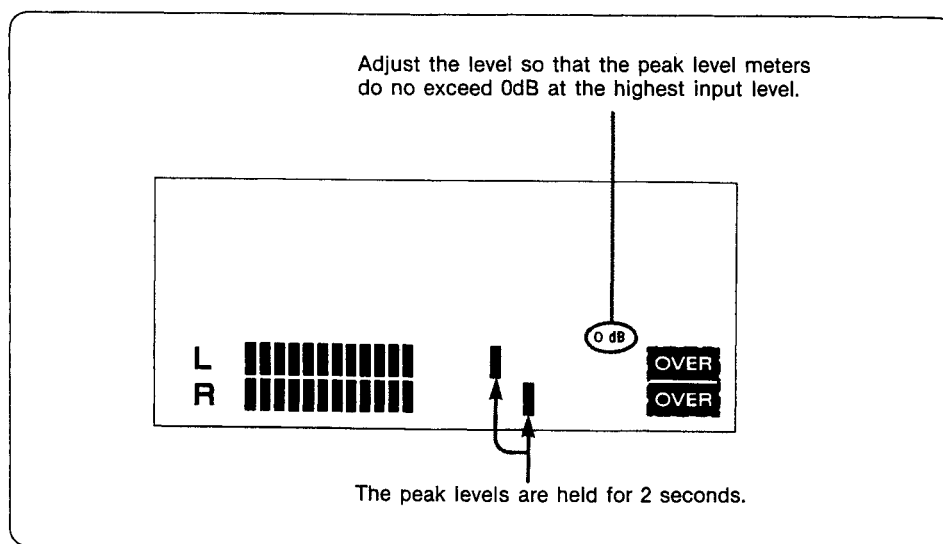
To stop recording for a moment

Press **II** PAUSE.
The indicator lights up and the recorder enters recording pause mode.
To resume recording, press **II** PAUSE again.

When recording is finished

Press **■** STOP.
Recording mode will be canceled.

Recording level adjustment



When recording digital input

Recording level cannot be adjusted. Recording is performed with the same level as the source.

Note

The level of the output for monitoring during recording is approximately 1 dB lower than that of the playback output from the tape. In addition, the output for monitoring produces a phase difference between the right (R) and left (L) channels (41° at 22 kHz).

To record the time code simultaneously

When the time code of the external time code generator is input to the LTC IN connector, it is recorded simultaneously during recording.

Before recording, press LTC REC.
The red lamp on the key lights up.

Note

- When the ■ STOP key is pressed during recording, the tape stops and the LTC REC key is disengaged.
- If you write another time code signal on a tape with the time code signal already written, the recorder may not be able to read it correctly during playback.
- Use the time code recorded with this unit as time information only. (The time code is not recorded exactly by frame.)

Monitoring the remaining time

While playing back or recording, press MODE so that the REMAINING indicator appears in the display.

The total playing time counting from the current portion to the tape end is indicated.

If the peak level exceeds 0dB for a while

OVER indicator appears in the display. If the indicator lights up continuously, turn down the recording level to avoid sound distortion.

Note on recording pause mode

During pause, the tape is loaded. Avoid leaving the unit in pause mode for a long time. Otherwise, the tape and the heads may be damaged.

3-1-3. Writing the Sub Codes

With the PCM-2000, the following sub codes can be written when recording analog input signals.

- **Start ID:** Indicates a particular location, such as the beginning of a selection.
- **Program number:** Indicates the order of the start ID.
- **Skip ID:** Indicates the portion to be skipped during playback.

Among the above three sub codes, the start ID and program number can be written during recording and playback. The skip ID is writable only during playback*. (On writing during playback, refer to "Functions using the sub codes".)

Writing the start ID

With the following operation, the start ID can be written on the desired portion during recording.

At the point where you want to write the start ID, press ID WRITE in recording mode. The start ID will be recorded for 9 seconds. While the start ID is being written, the ID WRT indicator lights up in the display.

Note

The start ID is not automatically written when the input signal is supplied.

* When using a PCM-2000 as a digital source, the start and skip IDs on a tape can be recorded (copied), but not program number.

Note on writing the start ID

When you write another start ID, you cannot write it within 9 seconds after the previous one. To detect the start IDs correctly during playback, set them for more than 30 seconds apart.

Writing the program number

To write the program number starting from "1"

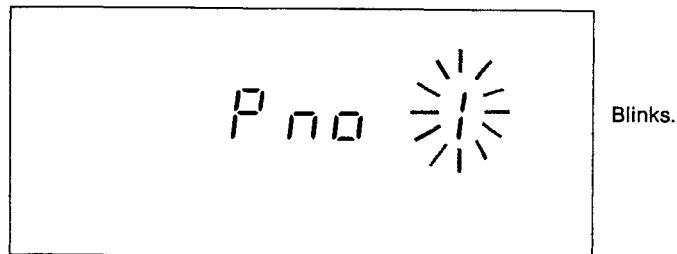
When recording the start ID, the program number will be written automatically starting from "1", simultaneously with the start ID. Each time a start ID is written, the program number increases by one.

After the cassette has been removed and inserted again or the unit has been turned off and then on again, the program number will be written starting from "1" again.

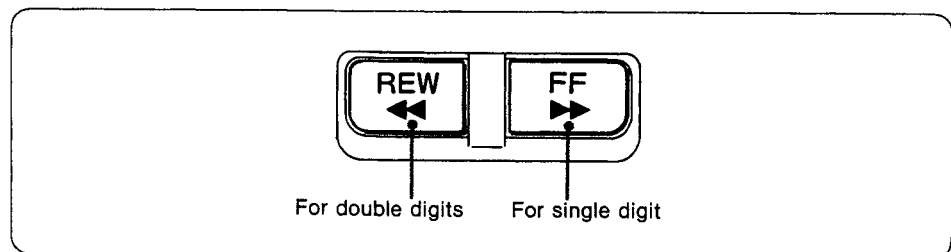
To write the program number starting from the desired number

Either at the top of the tape or not, you can write any program number (1 to 99) starting from the desired one.

- 1 Press MODE so that the "Pno" indication appears in the display*.
When the display shows the counter indication, press MODE twice.
- 2 Do either of the following so that the "Pno" indication blinks. The program number is ready to be changed.
 - Set the recorder in the record or recording pause mode after inserting the cassette. The "Pno" indication automatically starts blinking.
 - When "Pno" is lit steadily, press SEARCH so that it blinks.



- 3 Enter the desired number (1 to 99) by pressing the ►► FF or ◀◀ REW observing the blinking number.



- 4 Press ID WRITE to write the displayed number.
The program number lights when it is written on the tape.

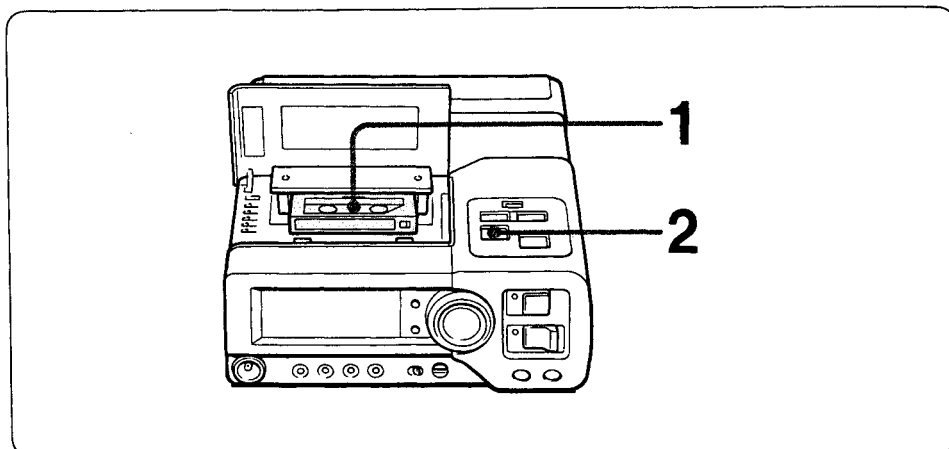
To display the previous program number after SEARCH is pressed
Press SEARCH again.

* The program number written last or detected during playback remains in the display. " — — " will be displayed if no number is detected or written.

3-2. Playback

3-2-1. Playback Procedure

Operation



1 Insert a cassette.
Refer to "2-4. About the DAT cassette".

2 Press ► PLAY.
Playback starts.

To stop play for a moment

Press ■ PAUSE during playback.
The indicator lights up.

To restart playback, press ■ PAUSE.

When playback is finished

Press ■ STOP.

Emphasis indicator in the display

When a pre-emphasis signal is detected during playback, the built-in de-emphasis circuit lowers the high frequencies automatically regardless of the EMPHASIS switch setting in the cassette compartment.

Automatic setting of the sampling frequency

Regardless of the Fs selector setting, the sampling frequency of the playback signal is automatically selected (except for the case the word sync signal is input).

Blinking of the sampling frequency

When the portion where no signal has been recorded is played back, the sampling frequency indication in the display blinks.

Note on pause mode

During pause, the tape is loaded. Avoid leaving the unit in pause mode for a long time. Otherwise, the tape and the heads may be damaged.

Checking the tracking of the signal being played back

By pressing the TRACKING key while playing back, the level meters in the display indicate the tracking level.

When the LTC signal is recorded on the tape

Normally, the tracking will be controlled automatically by the ATF (automatic tracking finding) circuit.

When a CTL signal is recorded, you can adjust it to the optimum level.

- 1** Press TRACKING.
- 2** Slide the ATF/CTL selector to CTL.
- 3** Set the tracking level meters to the highest level using the CTL control observing the tracking level meters in the display.
If, however, the playback sound becomes unstable with the ATF/CTL selector set to CTL, set it to ATF.

To synchronize with external equipment—WORD SYNC

Playback is performed in synchronization with external equipment.

- 1** Set the WORD SYNC selector of this unit to EXT.
Sync signal will be supplied from the equipment connected to the WORD SYNC connector of the unit.
- 2** Select the reference frequency with the Fs selector.

To record time code during playback. (Recording LTC afterwards)

Time code can be recorded separately during playback.

Connect the time code generator to the LTC IN connector of the unit. Press LTC key first. Then start playback. The LTC key will light in red.

Accuracy of the electronic linear time counter

- The linear time counter provided with this unit is not a clock. The time indicated by the counter may slightly differ from the actual recording/playback time. This allowance differs for the length of the tape or running position, etc.
- The unit cannot indicate the remaining time (—H—S) for a while after the tape has been started or during fast forwarding or rewinding.
- When the external word sync signal is input to the unit, the remaining time is not correctly indicated.

3-2-2. Cue and Review Function

Function

It is possible to advance or rewind the tape approximately 2.5 times faster than the playback speed while monitoring the playback sound.

Operation

During playback, keep pressing the ►► FF or ◀◀ REW.
Release the key at the point you want to resume playback.

3-2-3. Memory Stop Function

Function

You can rewind the tape to the desired portion where you stored in memory.

Operation

- 1** Check that the counter indication is displayed.
If the COUNTER indication is not displayed, press MODE.
- 2** Press MEMORY.
MEMORY indicator appears in the display.
- 3** Press RESET at the point you want to locate later.
The point where RESET is pressed is stored in memory, and the counter will be reset to "0H00M00S".
- 4** After playback or recording, press ◀◀ REW.
When the counter returns to "0H00M00S", the tape stops.

To release memory stop function

Press MEMORY so that the MEMORY indication in the display disappears.

3-3. Functions Using the Sub Codes

With the PCM-2000, various operations are possible using the following sub codes.

Sub code	Operation
Start ID	<ul style="list-style-type: none">• Searching for a particular portion such as the beginning of the selection• Searching for the start ID in order (Music scan)
Program number	Searching for the start ID with the corresponding number
Skip ID	Skipping the unwanted portion during playback

3-3-1. Searching for the Beginning of a Particular Portion Designated with a Start ID

Writing the start ID

The start ID is written at a point in the recorded portion such as the beginning of a selection, in either the recording or playback mode.

Writing the start ID during recording

Refer to "3-1-3. Writing sub codes".

Writing the start ID during playback

During playback, the start ID can be recorded with its position finely adjusted (rehearsal function).

- 1 Set the SKIP switch in the cassette compartment to OFF.
Start ID is selected.
- 2 During playback, press ID WRITE at the position where the start ID is to be written.
The ID WRT indicator blinks.
The portion for 3 seconds from the point where the key is pressed is played back repeatedly.
- 3 While listening to the repeated sound, adjust the "repeat start" point (or the beginning of the start ID) by pressing ►► FF or ◄◄ REW.
Each time the ►► FF (forward) or ◄◄ REW (backwards) is pressed, the point is shifted by 0.3 seconds on the tape.
- 4 When the beginning of the start ID is decided, press ID WRITE again.
The ID WRT indicator lights up steadily while the start ID is being written.

Notes

- The start ID cannot be written if the safety tab of the cassette is open.
- The program number cannot be recorded during playback.

Note on rehearsal

Repeating the rehearsal operation may damage the tape.
Avoid repeating a portion more than 10 times.

Searching for the start ID

- 1 Press SEARCH.
SEARCH indicator appears in the display window.
- 2 Press ►► FF or ◀◀ REW the number of times the start ID is to be skipped.
►► FF: Searches for the start ID ahead of the current position.
◀◀ REW: Searches for the start ID behind the current position.
The number of times the key is pressed is indicated in the seconds position.
When the desired start ID is reached, the indication shows "0", returns to the original indication, and then starts play.

Surveying the start ID portion (Music scan)

With this function, the portions of the tape where the start ID recorded portion are written (approx. 9 seconds each) are played back successively.

- 1 Press SEARCH during playback.
SEARCH indication appears in the display.
- 2 Press ► PLAY.
► and ◀◀ ►► indicator light up in the display.
- 3 Activate the music scan function.
To scan from the tape top: press ► PLAY (the tape is rewound to the tape top automatically).
To scan forward from the current position: press ►► FF.
To scan backwards from the current position: press ◀◀ REW.
During music scan, the indication in the display blinks.

To release music scan and continue playback

Press ► PLAY while the ID indicator is blinking.
The blinking counter lights up steadily.

When "Pno" is displayed

Searching for the start ID cannot be done. Change the display to the counter indication or the remaining time indication using the MODE selector.

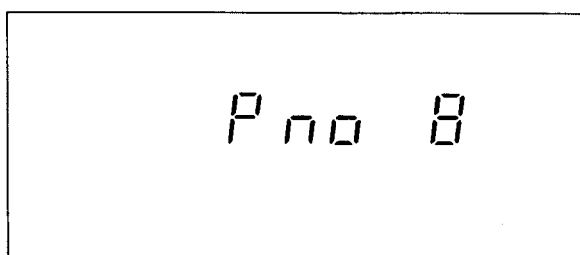
3-3-2. Selecting a Particular Portion (Start ID) with a Program Number

Writing the program number

Refer to "3-1-3. Writing sub codes".

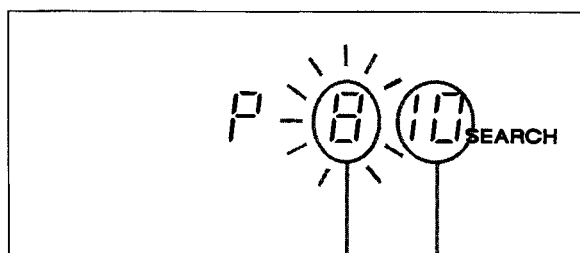
Selecting a start ID with a program number (Program search)

- 1 During playback, press MODE to display the program number.



Current program number

- 2 Press SEARCH.



Current program number
Blinks.

Desired program number
Lights up.

- 3 Enter the desired program number (1 to 99).
Single digit of the number: Use ►► FF.
Double digit of the number: Use ◀◀ REW.
- 4 Press SEARCH.
When the desired program number is found, playback starts from that portion.

Note on program search

If the program number is not written successively, or a start ID is added between the program numbers, program search may not be correctly done. In this case, stop the tape by pressing ■ STOP.

When "Pno--" is displayed

This indication appears when no program number is written on the tape or when the unit could not find the number.

3-3-3. Skipping Unwanted Portions Using the Skip ID

Using the skip ID, you can skip unwanted portion during playback.

Writing the skip ID

The skip ID can be written with its position finely adjusted (rehearsal function).

- 1** Set the SKIP switch in the cassette compartment to ON.
SKIP indicator is displayed.
- 2** During playback, press ID WRITE at the position where the skip ID is to be written.
The ID WRT indicator blinks slowly.
The portion for 3 seconds behind the point where the key is pressed is played back repeatedly.
- 3** While listening to the repeated sound, adjust the “repeat end” point by pressing **▶▶ FF** or **◀◀ REW**.
Each time the **▶▶ FF** (forward) or **◀◀ REW** (backward) is pressed, the point is shifted by 0.3 seconds on the tape.
- 4** When the portion where the skip ID is to be written is decided, press ID WRITE again.
The ID WRT indicator lights up while the skip ID is being written.

Skipping an unwanted portions

Set the SKIP switch to ON.
SKIP indicator appears in the display.

When a skip ID is detected during playback, the tape skips to the next start ID and plays back. The SKIP indicator disappears while the start ID is played back (the ID indicator lights up).

Note

During writing the skip ID, the skip ID cannot be written if the safety tab of the cassette is open.

Note on rehearsal

Repeating the rehearsal operation may damage the tape. Avoid repeating a portion more than 10 times.

3-3-4. Erasing the Sub Codes

The start and skip IDs written on the tape can be erased as follows.
The program number will be simultaneously erased with the start ID.

- 1** Select the ID you want to erase with the SKIP switch in the cassette compartment.
To erase the start ID and program number: set to OFF.
To erase the skip ID: set to ON.
- 2** In the playback or stop mode, after passing the ID, press ID ERASE.
The tape is rewound to the previous ID and the ID is erased.

Note

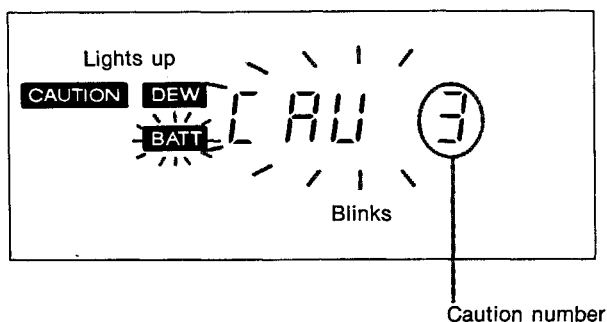
The sub codes cannot be erased if the safety tab of the cassette is open.

Indicator while the ID is erased

The ID ERS indicator blinks slowly while the ID is being searched for; it lights up while the ID is being erased.

4-1. Error Indication

If any trouble occurs in the unit, the corresponding indicators light up or blink in the display.



The following list shows the caution number and their meanings.

Caution No.	Meaning
1	Trouble with the tape drum (e.g. the drum stops)
2	Trouble with loading/unloading
3	On moisture condensation (see below)
4	Trouble with supply reel (e.g. the tape is entangled.)
5	Trouble with take-up reel (e.g. the tape is entangled.)
6	Trouble with tape (e.g. the tape is broken.)
—	Other trouble

The CAUTION indicator also lights up

When the battery pack is exhausted. The BATT indicator blinks as well.

On moisture condensation

If the equipment is brought directly from a cold to a warm location, or is placed in a very damp room, moisture may condense inside the unit.

Should this occur during operation, the CAUTION, DEW and CAU 3 indicators appear in the display.

The tape will be automatically unloaded, and stops after fast-forwarding or rewinding. After the tape stops, remove the cassette from the cassette holder and keep the cassette compartment lid open for while.

Do not use the unit until condensation inside the unit dries and the CAUTION indicator disappears in the display.

Note

Do not store the cassette in the recorder. Otherwise, the tape may adhere to the tape drum and be damaged, or the recorder may not operate correctly.

4-2. Specifications

Format

Tape	Digital audio tape (DAT format)
Head	Rotary head
Recording time	120 minutes (with DT-120)
Tape speed	8.15 mm/s
Drum rotation	Approx. 2,000 rpm
Error correction	Double Reed Solomon code

Digital audio characteristic

Number of channel	2 channels, stereo
D/A conversion	16-bit linear
Frequency response	20Hz–22,000 Hz (± 0.5 dB)
Signal-to-noise ratio	More than 87 dB (A-weighted)
Dynamic range	More than 87 dB
Total harmonic distortion	Less than 0.07% (at 1 kHz, –10 dBs, 20 kHz, LPF ON)
Channel separation	More than 80 dB
Wow and flutter	Below measurable limit
Equivalent microphone input noise	Less than –122 dBs (terminated at 200 ohms, A-weighted, MIC ATT selector at OFF)

Tape

Track pitch	13.6 μ m (20.4 μ m)
Sampling frequency	for playback and recording: 48 kHz, 44.1 kHz, 44.056 kHz 32 kHz (for recording digital inputs only)
Modulation	8–10 Modulation

Input

Analog inputs

Connector	Reference input	Maximum input	Impedance	Connector type
MIC	–70 dBs –50 dBs –30 dBs	–30 dBs (with MIC ATT at OFF)	10 kilohms balanced	XLR-3-31 or equivalent
LINE	–10 dBs	+24 dBs*	47 kilohms balanced	

* With the REC LEVEL control set at the position where the level meter reads –20 dB when a +4 dBs signal is input to the unit.

Digital inputs (AES/EBU format)

Connector	Rated input	Impedance	Connector type
DIGITAL IN	RS422	110 ohms	XLR-3-31 or equivalent

External sync input

Connector	Rated input	Input level	Impedance	Connector type
WORD SYNC	TTL level	2–5 V _{p-p}	75 ohms	BNC

Time code input

Connector	Rated input	Input level	Impedance	Connector type
LTC IN	No limitation	0.5–5 V _{p-p}	10 kilohms	BNC

Output

Analog outputs

Connector	Rated output	Impedance	Connector type
LINE OUT	2V RMS (full bit)	Z _o 1.6 kilohms	phono jack (RCA)
HEADPHONES	15 mW MAX	Z _L 32 ohms	Stereo phone jack

Digital outputs (AES/EBU format)

Connector	Rated output	Load impedance	Output impedance	Connector type
DIGITAL	RS422	110 ohms	10 ohms	XLR-3-32 or equivalent

Time code output

Connector	Rated output	Load impedance	Output impedance	Connector type
LTC OUT	3 ±0.5 V _{p-p}	More than 4 kilohms	10 kohms	BNC

General

Power requirements	DC 12 V With an NP-1A or NP-1 battery pack With external power input e.g. AC-500 AC power adaptor (optional)
Power consumption	Approx. 1.2 A (12 V DC IN)
Operating temperature	0°C to +40°C (32°F to 104°F)
Operating humidity	Less than 80% (relative humidity)
Storage temperature	−20°C to +60°C (−4°F to 140°F)
Dimensions	Approx. 212×77×263 mm (w/h/d) (8 ³ / ₈ ×3×10 ³ / ₈ inches)
Weight	Approx. 4.2 kg (9 lbs 4 oz)—incl. battery pack

Accessories supplied

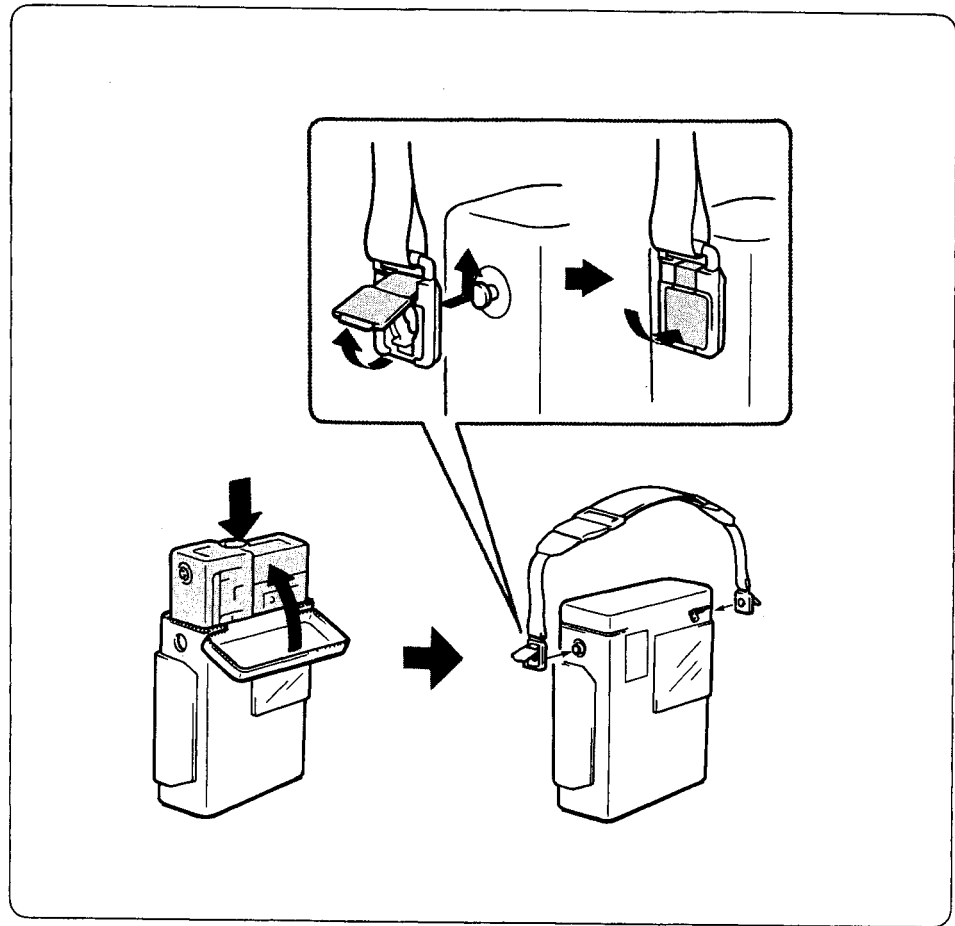
Shoulder strap (1)
Rain cover (1)
Operation manual (1)
Maintenance manual (1)

Recommended accessories

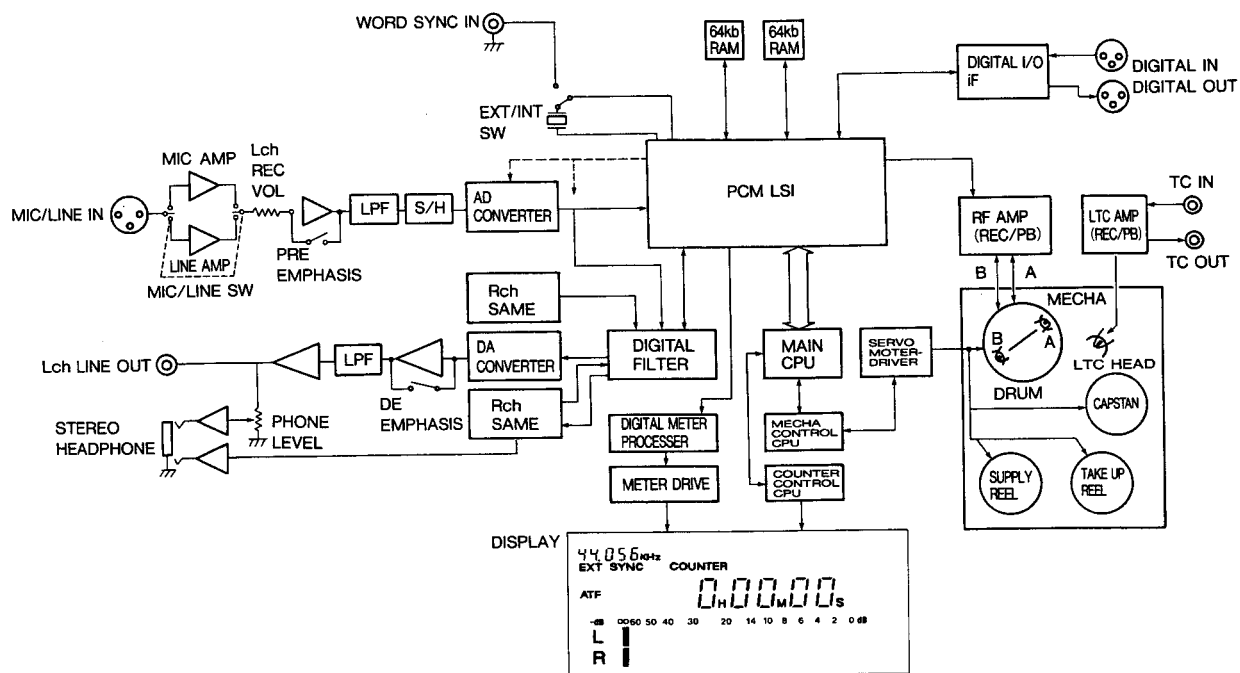
NP-1A or NP-1 battery pack
BC-1WA battery charger
AC-500 AC power adaptor
AC-F200 AC adaptor/battery charger

Design and specifications subject to change without notice.

4-3. Attaching the Shoulder Strap and Rain Cover



4-4. Block Diagram



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